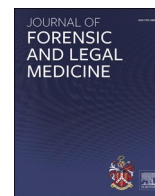




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Case report

COVID-19-related deaths in residential care homes for elderly: The situation in Italy

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ABSTRACT

The whole population is susceptible to infection but elderly people with previous diseases are at greater risk. All these epidemiological data show that older age represents an important risk factor for infection and especially for mortality. In recent weeks an increase in mortality among the elderly has been observed in many Italian residential care homes. In these accommodations a worrying spread of COVID-19 cases has been ascertained. According to the ISS report, 7.4% of the total deaths in care homes for elderly involved patients with SARS-CoV-2 infection and 33.8% involved patients with flu-like symptoms.

Herein, we discuss the dangerous spread of COVID-19 in residential care homes for elderly. In addition, we present a case of an elderly person admitted to a residential care home, whose COVID-19 diagnosis was performed only after death.

1. Introduction

Since December 2019, hospitals in Wuhan (Hubei, China) have reported several cases of unexplained and unexpected pneumonia, which have been classified as a new type of respiratory coronavirus infection (SARS-CoV-2).¹ The World Health Organization stated the COVID-19 outbreak a pandemic (March 2020).²

Symptoms of COVID-19 generally include cough (59–82%), fever (83–98%), shortness of breath (19–55%) and muscle pain (11–44%).³ Other less common symptoms are sore throat, rhinorrhoea, headache that may occur a few days before the beginning of temperature.³ Some infected people may have haemoptysis, gastrointestinal symptoms and a significant number of cases are asymptomatic.³ From a laboratory point of view, patients may have a normal or lower white blood cell count, thrombocytopenia, and increased C-reactive protein level.^{3–6}

Incubation generally lasts 1–14 days (median incubation period reported as about 5–6 days).^{7,8} Human-to-human transmission generally occurs via respiratory droplets or close contacts.⁸ This virus can float in the air (aerosol) and cause infection.⁸

The clinical evolution is heterogeneous: some patients may develop dyspnea while in others respiratory symptoms are absent.³ A high percentage of patients require admission to Intensive Care Units.³ In severe cases the disease may rapidly progress into acute respiratory distress syndrome (ARDS), septic shock or multi-organ failure.^{3,6,9} In

hospitalized patients, ARDS is observed in 17–29%.^{3,5}

The whole population is susceptible to infection but elderly people with previous diseases are at greater risk. In these cases, the most frequent underlying diseases are cardiovascular diseases, diabetes, hypertension and cerebrovascular diseases,^{1,10} chronic renal failure, chronic obstructive pulmonary disease. In general, elderly people develop a severe respiratory illness, more frequently they need to be admitted to Intensive Care Units and the mortality rate is extremely high.¹

On the other hand, the COVID-19 pandemic has had significant Medico-Legal issues and implications in Forensic Pathology.^{11–14}

Herein, we discuss the dangerous spread of COVID-19 in residential care homes for elderly. In addition, we present a case of an elderly person admitted to a residential care home, whose COVID-19 diagnosis was performed only after death.

2. Case report

We report a case that has come to our attention of a 90-year-old man admitted to a residential care home, whose COVID-19 diagnosis was performed only after death. The man had been admitted to this nurse homes for several months. The man was suffering from atherosclerosis vasculopathy, hypokinetic disease, malnutrition and hypertensive heart disease. During the last days of hospitalization, no relevant respiratory

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symptoms were reported, and radiological and diagnostic tests were not performed. Due to serious pre-existing diseases and terminal clinical aggravation and death were expected. We have no further health data.

The physicians of the residential care home attributed the death to cardiogenic shock caused by the serious pre-existing pathologies.

The corpse was transferred to the mortuary for hygiene reasons 5 days after death. The body was kept in a cold chamber with a constant temperature of 5 °C. The day after, the nasopharyngeal swab was performed to check for any unrecognized infection. The body showed no signs of putrefaction. The results of the first test were “indeterminate” (probably because the sample for the nasopharyngeal swab was not enough). The next day (i.e. 7 days after death) the nasopharyngeal swab was repeated. Through molecular tests with genetic amplification, the swab was positive for COVID-19. Therefore the infection could be a potential contributory cause of death.

After the diagnosis of infection, the autopsy was not performed because the care home physician drew up the necroscopic certificate and he determined the causes of death (so there was no medical reason). Furthermore, autopsies on COVID-19 positive people cannot be performed (except in special cases required by the Public Prosecutor) for safety reasons. In fact, in Liguria (region in North West Italy) there are no “safe” autopsy rooms (Airborne Infection Isolation Rooms - AIIRs).

3. Discussion

The growth of the elderly population is one of the most relevant demographic transitions.¹⁵ Senility determines an increased risk of vulnerability¹⁵ and a reduced daily autonomy. Often the elderly are alone or relatives are unable to provide complete and constant care. For this reason, the elderly are very often housed in care homes, where health personnel assist and care for them constantly. Care homes accommodate elderly people who do not need to be in a hospital, but who are not self-sufficient. Healthcare professionals look after medical needs and the daily needs of patients.

According to early Chinese statistics, the mortality rate (MR) in patients over 60 years of age is much higher than the general MR.^{1,16,17} In fact, in patients over 80 years of age the mortality rate is 14.8%, in patients between 70 and 79 years of age the MR is 8%. In addition, the proportion of deaths over 60 years of age represents 81% of total deaths.^{17,18} According to Italian data more than 83% of fatal cases of COVID-19 were over 70 years of age.¹⁹ The average age at death was 79 in men and 83 in women.²⁰

All these epidemiological data show that older age represents an important risk factor for infection and especially for mortality.¹⁹ This is because debilitated elderly patients with a depressed immune response have a significantly higher risk of developing severe acute respiratory syndrome.¹⁹

Because the elderly are often alone and no longer self-sufficient, they are often housed in residential care homes, where health care workers assist and care of them.

In Italy the problem is very serious because many regions have a high percentage of elderly people in the population. In particular, Liguria ranks first in terms of the number of elderly people.²¹

In recent weeks an increase in mortality among the elderly has been observed in many Italian residential care homes.

In these accommodations a worrying spread of COVID-19 cases has been ascertained. The increase in infectious diseases is due to probable structural and organizational deficiencies and inadequate infectious risk prevention measures. In addition, health care employees have worked with inadequate and scarce personal protective equipment (such as masks), thus promoting the spread of the virus. Moreover, poor diagnostic monitoring (as far as COVID-19 is concerned) of patients is carried out at residential care homes (in other words, nasopharyngeal swabs were only rarely performed on elderly patients, even in those with respiratory symptoms). This did not allow the early diagnosis of the disease and the correct isolation of infected persons.

For these reasons, some residential care homes had a marked spread of the virus and a significant increase in the mortality rate of the elderly.

In some cases, due to poor diagnostic monitoring by nasopharyngeal swab, the diagnosis of COVID-19 is not even performed during life but only post-mortem. For example, in the case presented, the diagnosis of COVID-19 was only performed after death.

The Istituto Superiore di Sanità (ISS) has recently published a very interesting document on contagion in care homes (updated to May 05, 2020).²² This valuable work is based on data made available by many Italian care homes (about 41,3% of the care homes contacted). According to this document, Of the 9154 patients who died, 680 had a positive nasopharyngeal swab and 3092 had flu-like symptoms. Therefore, 7.4% of the total deaths involved residents with SARS-CoV-2 infection and 33.8% involved residents with flu-like symptoms.²²

In relation to deaths of people with SARS-CoV-2 infection, the death rate is 0.7 per 100 residents. This value increases up to 2.7% in the province of Trento. In relation to the deaths of patients with flu-like symptoms, the mortality rate is 3.1%, but increases up to 6.5% in Lombardy.²²

The data are partial and incomplete, because few nasopharyngeal swabs were performed in care homes. The number of elderly deaths COVID-19 related could be much higher. The main problems that emerged from this work are: lack of personal protective equipment, difficulties in nasopharyngeal swabs (patients and health care workers), poor information received about the procedures to be performed to contain the infection, difficulties in isolating infected cases, lack of personnel and lack of medication.²² The criticalities reported are therefore many and serious and give an idea of the problem.

In Liguria, 14,7% of deaths in care homes for elderly were COVID-19 positive (swab confirmation) and 25% of deaths had flu-like symptoms; COVID-19 death rate in care homes for elderly was 1,3% (total deaths 136).²²

The data could be underestimated considering that many cases went unnoticed due to the poor diagnostic measures.

In Italy, in the period March–May 2020 there were about 50 thousand deaths more compared to the same period in the years 2015–2019. Of these, 72% is related to the increase in deaths of the population aged 80 and over (36 thousand and four hundred more deaths).²³ While 23% is related to the increase in mortality in the 65–79 age group in correspondence with the first wave of the COVID-19 epidemic; the increase compared to the average figure for 2015–2019 it is 11 thousand and seven hundred deaths.²³ In October and November 2020, the overall increase in deaths exceeded 31,000 and seven hundred units, of which over 23,000 more deaths in the age group over 80 years¹⁸ (see Table 1).

The spread of the virus in care homes is not only an Italian problem but concerns the whole of Europe. COVID-19 related deaths in long-term care facility residents are around 30–60% of all SARS-CoV-2 deaths in many European countries.²⁴

These critical issues also have Medico-Legal interest for the growth of judicial investigations concerning the increase in deaths in residential care homes during the pandemic period. This is to ascertain a professional liability due to organizational errors and structural deficiencies that have favoured the spread of the virus and contagion (i.e. liability for spreading disease).

For this reason, we believe it is necessary for the international community to be aware of this serious problem.

The case reported shows that infection in residential care homes are often underestimated because both patients and staff are not adequately monitored, and they have not undergone diagnostic checks. This

Table 1

Mortality numbers in Italy, in the period between March and May 2020.

March–May 2020	50,000 more deaths than in previous years.
36,400 deaths in people over 80 (72%)	
11,700 deaths in people aged 65 to 79 (23%)	

problem naturally favours, even more so, the spread of the virus. Therefore, all cases of suspicion and health care workers should undergo nasopharyngeal swabs. This will make it possible to reduce contagion and related COVID-19 deaths in the elderly.

In addition, our results indicate that nasopharyngeal swab can give reliable results even 7 days after death if the corpse is properly preserved. Post-mortem nasopharyngeal swab is always necessary to implement epidemiological data about COVID-19-related deaths and it is also useful to define the causes of death for Medico-Legal and judicial purposes.²⁵

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Declaration of competing interest

None.

References

- Liu K, Chen Y, Lin R, Han K. Clinical features of COVID-19 in elderly patients: a comparison with young and middle-aged patients. *J Infect.* 2020;80(6):e14–e18.
- CDC COVID-19 Response Team. Severe outcomes among patients with coronavirus disease 2019 (COVID-19) - United States, February 12-March 16, 2020. *MMWR Morb Mortal Wkly Rep.* 2020 Mar 27;69(12):343–346.
- Tu YF, Chien CS, Yarmishyn AA, et al. A review of SARS-CoV-2 and the ongoing clinical trials. *mInt J Mol Sci.* 2020 Apr 10;(7):21. pii: E2657.
- Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet.* 2020;395(10223):497–506.
- Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *J Am Med Assoc.* 2020;323(11):1061–1069.
- Guan WJ, Ni ZY, Hu Y, et al. China Medical Treatment Expert Group for Covid-19. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med.* 2020; 382:1708–1720.
- Li T, Lu H, Zhang W. Clinical observation and management of COVID-19 patients. *Emerg Microb Infect.* 2020 Dec;9(1):687–690.
- Kolifarhood G, Aghaali M, Mozafar Saadati H, et al. Epidemiological and clinical aspects of COVID-19; a narrative review. *Arch Acad Emerg Med.* 2020;8(1):e41.
- Paraskevis D, Kostaki EG, Magiorkinis G, Panayiotakopoulos G, Sourvinos G, Tsiodras S. Full-genome evolutionary analysis of the novel corona virus (2019-nCoV) rejects the hypothesis of emergence as a result of a recent recombination event. *Infect Genet Evol.* 2020;79:104212.
- Li JY, You Z, Wang Q, et al. The epidemic of 2019-novel-coronavirus (2019-nCoV) pneumonia and insights for emerging infectious diseases in the future. *Microb Infect.* 2020;22(2):80–85.
- Dijkhuizen LGM, Gelderman HT, Duijst WLJM. Review: the safe handling of a corpse (suspected) with COVID-19. *J Forensic Leg Med.* 2020;73:101999.
- Barranco R, Ventura F. The role of forensic pathologists in coronavirus disease 2019 infection: the importance of an interdisciplinary research. *Med Sci Law.* 2020;60(3): 237–238.
- Barranco R, Vallega Bernucci Du Tremoul L, Ventura F. Hospital-acquired SARS-Cov-2 infections in patients: inevitable conditions or medical malpractice? *Int J Environ Res Publ Health.* 2021 Jan 9;18(2):489.
- Barranco R, Messina C, Bonsignore A, Cattrini C, Ventura F. Medical liability in cancer care during COVID-19 pandemic: heroes or guilty? *Front Public Health.* 2020; 8:602988.
- Barbosa KTF, Oliveira FMRL, Fernandes MGM. Vulnerability of the elderly: a conceptual analysis. *Rev Bras Enferm.* 2019;72(Suppl 2):337–344.
- Liu Y, Gayle AA, Wilder-Smith A, et al. The reproductive number of COVID – 19 is higher compared to SARS coronavirus. *J Trav Med.* 2020;27(2). pii: taaa021.
- Wang L, He W, Yu X, et al. Coronavirus disease 2019 in elderly patients: characteristics and prognostic factors based on 4-week follow-up [published online ahead of print, 2020 Mar 30] *J Infect.* 2020;S0163–4453(20):30146–30148.
- Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med.* 2020;382(18):1708–1720.
- Abbatecola AM, Antonelli-Incalzi R. Editorial: COVID-19 spiraling of frailty in older Italian patients. *J Nutr Health Aging.* 2020;24(5):453–455.
- Istituto Superiore di Sanità. Characteristics of SARS-CoV-2 patients dying in Italy report based on available data on April 16th, 2020. https://www.epicentro.iss.it/en/coronavirus/bollettino/Report-COVID-2019_16_april_2020.pdf (accessed 24.04.20).
- Molinelli A, Ventura F, Lo Pinto S, Drommi M, De Stefano F. Elder abuse in Europe's "most elderly" city: an assessment of the phenomenon and an analysis of the data from the Penal Court of Genoa from 2010 to 2015. *Aging Clin Exp Res.* 2017;29(6): 1285–1290.
- Istituto Superiore di Sanità. Survey nazionale sul contagio COVID-19 nelle strutture residenziali e sociosanitarie. Report finale. Aggiornamento 05 maggio ore 20.00. <https://www.epicentro.iss.it/> (accessed 03.03.21).
- Istituto Nazionale di Statistica and Istituto Superiore di Sanità. *Impatto Dell'epidemia COVID-19 Sulla Mortalità Totale Della Popolazione Residente Periodo Gennaio-Novembre 2020*; 2020. https://www.istat.it/it/files//2020/12/Rapp_Istat_Iss.pdf (accessed 03.03.21).
- ECDC Public Health Emergency Team, Danis K, Fonteneau L, et al. High impact of COVID-19 in long-term care facilities, suggestion for monitoring in the EU/EEA, May 2020. *Euro Surveill.* 2020;25(22):2000956.
- Ventura F, Barranco R. Cadaveric nasopharyngeal swab in coronavirus disease 2019 infections: can it be useful for medico-legal purposes? *Am J Forensic Med Pathol.* 2020 Sep;41(3):238–239.